

ALDOT-454-(2015)

Procedure for Calibrating Microsurfacing Equipment

- 1.1. This procedure provides a method for calibrating microsurfacing equipment to verify individual component material output. These calibrations of the individual machines are necessary because of the continuous feed nature of the mixing machines.
- 1.2. This procedure also helps to ensure that should the size of the project be large enough for the Contractor to justify the use of multiple mixing machines, all of the mixing machines will place the materials at the specified rate and in accordance with the approved job mix formula.

2. Referenced Documents

- 2.1. [ALDOT SPECIFICATIONS](#)
 - Section 401 Bituminous Surface Treatments
- 2.2. [BMT FORMS](#)
 - BMT 213 Microsurfacing Calibration Worksheet
- 2.4. ISSA A-143
- 2.5. NCHRP Synthesis 411- Microsurfacing
- 2.6. AASHTO T 255 Total Evaporable Moisture Content of Aggregate by Drying

3. General Requirements

- 3.1. This section provides general calibration requirements for microsurfacing equipment used for quality control for acceptance testing on Department paving projects where microsurfacing paving specifications are applicable.
- 3.2. An ALDOT Engineer must be present during the calibration procedure.
- 3.3. Obtain the job mix design from the contractor.
- 3.4. Review the job mix formula to ensure the emulsion and aggregates are from approved ALDOT sources.
- 3.5. The asphalt emulsion pump, the aggregate gates, and the dry additive/mineral filler gates all shall be calibrated prior to the beginning of production.
- 3.6. The calibration process shall accomplish the following tasks:
 - Set the machine(s) to verify component material output

- Establish the consistency of the feeds of the equipment if more than one mixing machine is used on a project.
- Establish a standard for the data output from the calibrated machine(s).

4. Emulsion Calibration Procedure

- 4.1. The Contractor will use Subarticle 401.03(a) to ensure that the asphalt emulsion pump is working correctly and ensure the feed rates are as set by the job mix formula.
- 4.2. The emulsion pumps shall be calibrated as follows:
 - 4.2.1. Empty machine of all aggregates.
 - 4.2.2. Fill the machine with emulsion and determine the gross weight using a calibrated set of truck scales.
 - 4.2.3. Weigh aggregate on certified scales prior to adding to the machine, record weight.
 - 4.2.4. Hook pump outlet to a second container with a volumetric capacity of approximately 600 to 700 gallons, to contain the amount of emulsion pumped during calibration process.
 - 4.2.5. Pump from the emulsion truck into the second container for a minimum of 12,000 counts of emulsion (yields approximately 50 gallons of emulsion) on the aggregate counter.
 - 4.2.6. Determine weight of emulsion that has been pumped from the machine.
 - 4.2.7. Perform the pumping process a minimum of three (3) times to ensure accurate results.
 - 4.2.8. For each trial pumping process, divide the pounds of emulsion by the count of the aggregate counter to determine the rock count.
 - 4.2.9. For each trial pumping process, divide the pounds of emulsion by the count of the emulsion counter to determine the emulsion count.

Example:

Starting Weight (a)	a = 0.00
Ending Weight Emulsion (b)	b = 406.00
Pounds of emulsion (b-a) = c	c = 406.00
Counts of emulsion counter (d)	d = 12015.00
Counts of Rock counter (e)	e = 2540.00
1) Pounds of emulsion per aggregate count (c/e) = f¹	f¹ = 0.1598
2) Pounds of emulsion per emulsion count (c/d) = g¹	g¹ = 0.0338

- 4.2.10. The emulsion pump shall deliver emulsion to the pug mill with a volumetric consistency that is within 2% of the mathematical average of three (3) runs of at least 12,000 counts (approximately 50 gallons) of emulsion.

- 4.2.11 The Contractor shall use BMT 213 worksheet titled “Emulsion Calibration Worksheet” for calculating the results of the emulsion pump calibration.
- 4.2.12 The Contractor will ensure that the Engineer receives a copy of the completed calibration forms for the project files.

5. Dry Additive/Mineral Filler Calibration

- 5.1.1 Empty machine of all aggregates.
- 5.1.2 Use a small pan or other applicable container suitable for catching the amount of dry additive/mineral filler that will fall from the feeder during calibration process.
- 5.1.3 Weigh the empty container and record the weight prior to performing the calibration process.
- 5.1.4 Using the “fines counter” to count the turns of the head pulley or the fines feeding auger, run out a minimum of 10 counts of material into the container.
- 5.1.5 Reweigh the container containing the filler and subtract the empty weight of the container. The weight of material divided by the number of counts from 5.1.4 above gives the weight per turn of the pulley/auger.
- 5.1.6 Perform the process a minimum of three (3) times per gate setting at three different gate settings to develop an average for the material at various gate settings to help ensure accurate results.
- 5.1.7 Calculate the desired setting to meet the job mix formula requirements.
- 5.1.8 The Contractor shall use BMT 213 titled ‘Cement Calibration Worksheet’ for calculating the results of the average pounds per count of cement calibration.
- 5.1.9 The Contractor will ensure that the Engineer receives a copy of the calibration worksheets for the project files.

6 Aggregate Gate Calibration

6.1 Aggregate Moisture

- 6.1.1 Test the aggregate for moisture following AASHTO T 255.
- 6.1.2 Calculate the moisture factor. The moisture factor is the percent (in decimal format) of the moisture in the aggregate + 1.00.

Example:

A moisture is calculated to be 5%, therefore the moisture factor is:
 $0.05 + 1.00 = 1.05$ moisture factor.

6.2 Calibrate Gate Settings

- 6.2.1 Select three (3) gate openings
- 6.2.2 Aggregate larger than the #4 sieve shall be screened out at the plant and remaining aggregate shall be weighed prior to placing aggregate into the transport vehicle.
- 6.2.3 Using the following table, perform calibration by running material, at least two (2) times per gate setting, recording the net weight conveyed and the number of counts of the rock belt for the three test samples.

Table 1	
3" gate	Minimum of 700 counts
4" gate	Minimum of 500 counts
5" gate	Minimum of 300 counts

- 6.2.4 The placement machine shall deliver such volumetric consistency that the deviation for any aggregate delivery rate check-run shall be within 2% the mathematical average of three (3) runs.
- 6.2.5 Determine the average dry weight per count using BMT 213 worksheet titled "Aggregate Calibration Worksheet" to determine the dry aggregate pounds per count. If the results do not yield a straight line, the tests shall be rerun.

Example:

- 1. Aggregate weight divided by no. of counts equals pounds per counts (3" gate)
 Pounds of aggregate = 580.00 (A)
 Number of counts = 704 (B)
 Pounds per counts = (C)

$$A \div B = C$$

$$580.00 \div 704 = 0.8239 \text{ lbs. per count}$$

- 2. Dry Aggregate Weight per Count = Average aggregate weight per count divided by moisture factor.
 Average weight per count determined to be 0.8239 pound (D)
 Moisture factor determined to be 1.0371 (E)
 Dry Aggregate Weight per count (F)

$$D \div E = F$$

$$0.8239 \div 1.0371 = 0.7944 \text{ lbs. per count}$$

6.3 Calibrate machine at job mix formula.

- 6.3.1 Set the gate to the settings required by the job mix formula.
- 6.3.2 Run sufficient material past the gate to establish the flow and fill the gate.
- 6.3.3 Reset the aggregate counter to zero.
- 6.3.4 Run material out of the machine and stop the belt as the counter changes to a new count to avoid partial counts.
- 6.3.5 Remove any excess material from the belt that may have passed the gate but not fallen into the pug mill.
- 6.3.6 The net weight of the run divided by the count of aggregate counter provides the pounds of aggregate per revolution of the head pulley.

7 Reporting

- 7.1 Report test results on BMT 213 Summary Worksheet.
- 7.2 All documentation shall be sent to the Project Engineer.